CLAIMS

1. A method of forming transparent electrodes (35) on a substrate (33), the method comprising the steps of:

depositing a patterned layer of a thermally decomposable ink composition on a substrate by gravure offset printing, the thermally decomposable ink composition comprising an electrically conductive metal oxide having a particle size of less than the wavelength of visible light, a nitrocellulose binder, an alcohol solvent and an organic co-solvent having a boiling point of more than 250°C; and

heating the thermally decomposable ink composition.

2. The method of claim 1, wherein heating the thermally decomposable ink composition comprises thermally decomposing the thermally decomposable ink composition.

3. The method of claim 1 or 2, wherein the electrically conductive metal oxide has an average particle size of less than 0.1μm.

4. The method of any one of claims 1 to 3, wherein the electrically conductive metal oxide has an average particle size in the range 3nm to 80nm.

5. The method of any one of claims 1 to 4, wherein the electrically conductive metal oxide is indium doped tin oxide.

6. The method of any one of claims 1 to 5, wherein the solvent comprises at least one of an alkylalcohol, a monoalkyl ethyleneglycol and a monoalkyl propyleneglycol.

7. The method of any one of claims 1 to 6, wherein the solvent comprises isopropoxyethanol.

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8. The method of any one of claims 1 to 7, wherein the organic co-solvent comprises at least one of an acetate, an alkylalcohol, an ester, a mono or dialkyl ether of an ethyleneglycol and a mono or dialkyl ether of a propyleneglycol.

9. The method of any one of claims 1 to 8, wherein the organic co-solvent comprises at least one of tri propylene glycol and tetra ethylene glycol.

10. The method of any one of claims 1 to 9, further comprising the step of homogenising the thermally decomposable ink composition prior to the step of depositing the patterned layer of the thermally decomposable ink composition.

11. The method of any one of claims 1 to 10, wherein the step of depositing the patterned layer of the thermally decomposable ink composition comprises the steps of:

filling patterned grooves in the surface of a cliché with the thermally decomposable ink composition;

transferring the thermally decomposable ink composition from the patterned grooves to the surface of a blanket by bringing the blanket in to contact with the surface the cliché; and

transferring the thermally decomposable ink composition from the surface of the blanket to the surface of the substrate by bringing the blanket in to contact with the surface of the substrate.

12. The method of any one of claims 1 to 11, wherein the step of heating the thermally decomposable ink composition comprises firing the thermally decomposable ink composition at a temperature of no more than 400°C in the presence of oxygen.

13. The method of any one of claims 1 to 12, wherein the step of heating the thermally decomposable ink composition comprises the steps of:

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firing the thermally decomposable ink composition in an air atmosphere at a temperature in the range 200°C to 400°C for at least 50 minutes; and

firing the thermally decomposable ink composition in a reducing atmosphere of hydrogen and nitrogen at a temperature in the range 200°C to 400°C for at least 50 minutes.

14. A thermally decomposable gravure offset printing ink composition for use in forming transparent electrodes (35) on a substrate (33), comprising:

an electrically conductive metal oxide having a particle size of less than the wavelength of visible light;

a nitrocellulose binder;

an alcohol solvent; and

an organic co-solvent having a boiling point of more than 250°C.

15 15 The composition of claim 14, wherein the electrically conductive metal oxide has an average particle size of less than 0.1μm.

16. The composition of claim 14 or 15, wherein the electrically conductive metal oxide has an average particle size in the range 3nm to 80nm.

17. The composition of any one of claims 14 to 16, wherein the electrically conductive metal oxide is indium doped tin oxide.

18. The composition of any one of claims 14 to 17, wherein the nitrocellulose binder contains from 10.9 to 11.3 wt% nitrogen.

19. The composition of any one of claims 14 to 18, wherein the solvent comprises at least one of an alkylalcohol, a monoalkyl ethyleneglycol and a monoalkyl propyleneglycol.

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20. The composition of any one of claims 14 to 19, wherein the solvent comprises isopropoxyethanol.

21. The composition of any one of claims 14 to 20, wherein the organic co-solvent comprises at least one of an acetate, an alkylalcohol, an ester, a mono or dialkyl ether of an ethyleneglycol and a mono or dialkyl ether of a propyleneglycol.

22. The composition of any one of claims 14 to 21, wherein the organic co-solvent comprises at least one of tri propylene glycol and tetra ethylene glycol.

23. The composition of any one of claims 14 to 22, wherein the electrically conductive metal oxide is 15 to 25 wt% of the composition.

24. The composition of any one of claims 14 to 23, wherein the nitrocellulose binder is 15 to 25 wt% of the composition.

25. The composition of any one of claims 14 to 24, wherein the solvent is 45 to 60 wt% of the composition.

26. The composition of any one of claims 14 to 25, wherein the organic co-solvent is 5 to 15 wt% of the composition.

27. A substrate (33) having transparent electrodes (35) formed by:

depositing a patterned layer of the composition of any one of claims 14 to 26 on a substrate by gravure offset printing; and

heating the composition to form the transparent electrodes.

28. The substrate of claim 27, wherein heating the composition comprises thermally decomposing the composition.

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